BULLETIN No. 10

DEPARTMENT OF AGRICULTURE.

SPECIAL REPORT

ON

Prepared Foods for Invalids and Infants,

BY

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DEPARTMENT OF AGRICULTURE.

OFFICE OF SPECIAL AGENT.

Pittsburg, Pa., May 28, 1896.

Maj. Levi Wells,
Dairy and Food Commissioner.

Thos. J. Edge, Secretary of Agriculture, Harrisburg, Pa.:

Dear Sirs: I have the honor to transmit herewith the report of Professor F. T. Aschman, of Pittsburg, Pa., who has conducted a series of examinations into the chemical constituents of a number of foods generally on sale in the western part of the State, and which are recommended and sold as suitable for infants and invalids, and for which a number of beneficial qualities and attributes are claimed.

While I have conducted these investigations without special instructions from the Department, I feel that these preparations properly come within the provisions of the pure food law of the State, and as improper elements in their composition are liable to do much injury, in an insidious way, to many debilitated persons, and to children of weak constitution, the results cannot but be highly instructive, and of importance to the public.

It will be seen that infants of tender age nourished on some of these preparations may be greatly injured without the cause of their ailments being suspected by the parent until too late for the physician to relieve the malady induced from aggravated indigestion caused by use of improper food. It is no reflection on their professional acumen to state that many physicians in rural communities have not opportunity or facilities to investigate the constituents of such preparations, and they are, therefore, obliged to accept the statements and recommendations of the manufacturers.

By reason of a lack of knowledge of the physiological processes of digestion, and the assimilation of food elements in the infantile stomach, many of the manufacturers of these preparations no doubt conscientiously believe them to be what they are recommended, and advertise them in good faith as valuable adjuncts to infantile nutrition in cases where the natural food supply is inadequate. While manufacturers are actuated by humane motives, and with the best possible

intentions, the analyses show, according to the testimony of competent and authoritative physiologists, that many of these preparations should not be administered to infants of tender age, or to those suffering from emaciating diseases. This information should, in my judgment, be available to the citizens of the Commonwealth. With that motive in view, I have had these analyses made, and the results as embraced in Prof. Aschman's report are respectfully submitted.

F. N. MOORE,
Special Agent.

REPORT OF CHEMIST.

Pittsburg, Pa., May 28, 1896.

F. N. Moore, Esq., Special Agent, Agricultural Department of Pennsylvania:

Dear Sir: I herewith beg to submit to you the results of my analyses of the evaporated creams, condensed milks, liquid foods, peptonoids and the foods for infants and invalids which you asked me to examine. These samples were in all cases in the original packages and in a sealed condition when taken for analysis.

The analyses resulted as follows:

Evaporated Creams and Unsweetened Condensed Milks.

Name of brand.	Water. Per cent.	Fat. Per cent.	Protein. Per cent.	Milk Sugar. Per cent.	Cane Sugar. Per cent.	Ash. Per cent.
First Swiss,	62.72	10.68	9.23	13.72	.....	2.04
Highland,	68.75	9.63	9.21	10.89	.....	1.52
Howell's,	71.92	8.81	8.53	9.82	.....	1.82
Imperial,	69.54	9.56	8.61	10.42	.....	1.87
Loeflund,	68.37	7.81	10.17	11.84	.....	1.81
Monroe,	69.64	8.91	9.54	10.44	.....	1.47
Roman shorn,	66.28	10.39	9.77	11.47	.....	2.09
St. Charles,	66.46	9.26	10.49	12.24	.....	1.55
CONDENSED MILKS.						
Anglo-Swiss,	21.56	9.37	9.16	13.39	40.45	2.07
Baby,	22.99	10.61	9.91	14.24	40.17	2.08
Dime,	23.88	7.34	10.07	12.70	43.95	1.96
Full weight,	25.58	9.29	9.44	11.71	42.14	1.84
Gail Borden "Eagle,"	30.16	7.51	8.40	9.82	42.24	1.87
Good Luck,	27.11	8.29	9.03	12.74	40.87	1.98
Jersey,	24.25	9.86	8.44	12.33	43.19	1.93
Leader,	22.66	9.73	9.23	12.98	43.44	1.96
Magnolia,	25.58	8.04	8.21	10.68	45.48	2.01
Milk-mald,	25.76	9.03	9.33	10.18	43.72	1.98
Nestle,	24.20	9.81	10.49	11.66	41.63	2.21
Porcelain,	24.43	7.01	10.42	12.63	43.80	1.71
Red Cross,	25.97	7.93	8.91	11.93	43.77	1.49
Red Star,	25.55	9.74	9.38	10.87	42.31	2.13
Rival,	21.63	9.36	8.72	11.81	46.61	1.87
Sweet Clover,	24.51	8.31	8.75	11.88	44.58	1.97
United States,	30.29	7.21	8.74	12.04	39.80	1.92

Liquid Foods and Peptonoids.

Name or Brand.	Water.	Fat.	Protein.	Carbohydrates.		Fibre.	Ash.	Remarks.
				Soluble.	Insoluble.			
Beef peptonoids (dry),	4.91	3.49	63.18	. . . . .	. . . . .	. . . . .	3.54	Sp. gr. 1.049.
Bovinine,	62.18	Trace.	15.35	. . . . .	. . . . .	. . . . .	4.30	Contains alcohol and boracic acid.
Bovox,	52.23	Trace.	24.49	. . . . .	. . . . .	. . . . .	2.18	Sp. gr. 1.020.
Murdock's liquid food,	75.81	0.11	12.91	. . . . .	. . . . .	. . . . .	5.27	Sp. gr. 1.244 contains alcohol.

Food for Infants and Invalids.

Carnrick's soluble food,	3.12	6.26	16.32	56.62	14.44	0.22	3.02	
Horlick's food,	3.64	2.01	11.28	63.14	17.28	0.73	1.92	
Horlick's malted milk,	2.87	7.81	16.61	59.43	10.95	0.52	1.81	
*Hubbell's prepared wheat,	5.93	1.19	14.81	16.16	60.86	0.31	0.44	
Imperial granum,	10.57	1.32	19.37	15.42	51.88	0.31	1.13	
*Just's dietetic food,	4.83	0.79	3.85	70.60	18.31	0.51	1.11	
Lacto-preparata,	3.28	6.26	22.48	58.89	7.21	0.81	1.07	
Liebe's soluble food,	22.03	0.08	3.32	76.38	. . . . .	. . . . .	1.41	
*Mellin's food,	3.93	2.04	11.87	59.45	17.71	0.53	4.47	
Milkine,	2.74	7.12	13.37	61.19	13.63	0.63	1.32	
Nestle's food,	2.37	4.94	11.04	43.75	35.75	0.47	1.61	
*Nursing meal,	10.84	2.36	6.22	44.66	32.96	0.63	2.31	Contains cocoa.
*Nutrico food,	11.87	4.38	13.40	9.75	57.83	0.61	1.77	
*Ridge's food,	8.87	1.67	13.37	8.32	66.35	0.81	0.61	
Wagner's infant food,	5.07	10.91	14.81	37.91	28.95	0.37	2.01	
*Wells, Richardson & Co., lactated food,	2.94	2.67	13.22	28.84	48.45	1.37	2.51	
*Zimmerman's health food,	6.79	1.33	11.16	14.73	63.97	0.71	1.31	

*See page 7.

Before going into a consideration of these results, it may be well first to review briefly a few points in regard to foods in general.

A perfect food is one that contains in the proper proportions and in a digestible form, all the elements that go to make up and maintain the system and allow its organs to perform their proper functions. As the animal system is composed chiefly of water, protein (constituting the muscles, brain, blood, etc.), fat, carbohydrates (needed to keep up most of the animal heat), and mineral matter or ash (necessary to form the bones, teeth, etc.), a complete food will contain all of these proximate elements. Milk, for instance, which during the first period of healthy animal life serves as the sole nourishment, is such a perfect food. It contains the water, the protein as casein and albumen, the carbohydrates as milk-sugar, the milk—or butter-fat and the ash. However, it must be remembered, that some of these elements can be substituted the one for the other; especially is this the case with the carbohydrates and the fat, which former will frequently take the place of the latter. Thus, bread, "the staff of life," is considered an almost perfect food, although it contains but little fat; but the starch (a carbohydrate) it is so largely composed of, is utilized in the system and by it frequently converted into fat. The protein, which is very rich in the element nitrogen, is on the other hand, not easily replaced, and as it is of extreme importance in the formation and maintenance of the blood, muscles, brain and nerves, a food or diet deficient in this respect will not long maintain the animal system in a proper condition. Liebig calls it the "vital principle of food." It is also the most expensive constituent of foods; thus an animal diet which contains it in large quantities is more expensive than a vegetable diet not containing it so abundantly.

Apply now the above facts to the food products analysed, and we find that many of them are not perfect foods by any means, but that they are often seriously deficient in some important direction.

The so-called "evaporated creams" prove themselves to be in truth milk evaporated to about one-third its bulk, no cane-sugar being added, as is the case with the "condensed milks." Both classes of products are unobjectionable, though one or two of the samples are suspiciously low in fat, and may have been made from partially skimmed milk. It would seem, also, as if the name "evaporated cream" should give way to the more truthful one of "evaporated milk," or to the one used in some cases, viz: "cream-milk."

As regards the liquid foods and the beef peptonoids, they are very rich in protein or flesh forming elements. They are prepared from meat, by the use of the super-heated steam, as a rule; and in the case of the peptonoids are artificially digested, in part at least, by the aid

of digestive ferments. They are to be looked upon as condensed "beef-teas," in fact, and like beef-tea, are to be considered as being more like stimulants than foods, requiring other nourishment to be taken at the same time they are used. This stimulating effect is still more pronounced where alcohol is present, as in some cases. The use of preservatives, employed in some of these goods which are recommended for use by invalids and convalescents, is to be strongly condemned, as such preservatives cannot but be injurious to weak digestive organs.

In the "foods for infants and invalids," a wide diversity is noticeable. Some will be seen to be rich in the important protein or nitrogenous substances, while others are remarkably deficient in them. Under the head of "carbohydrates," the analysis was so conducted as to indicate the soluble carbohydrates as distinguished from the insoluble. This was done because the former are, in this class of foods at least, much more important and more easily assimilated than the latter. The soluble carbohydrates include such substances as cane-sugar and milk sugar, glucose, dextrose, etc., the various gums and similar compounds. The insoluble carbohydrates indicated in these analyses, are practically all starch, as the fibre, which is also an insoluble carbohydrates, was determined separately. The soluble carbohydrates, it will be seen, are present in large quantities in some instances, while in other cases the carbohydrates are practically all insoluble, in other words starch is present in large proportions and the sample consists really of finely bolted wheat, oats or barley. This in a food for infants, is objectionable. As has been truly said, an excessive use of starch in the food of infants results in the generation of lactic acid in the alimentary tracts which again gives rise to diarrhoeas and dysenteric ailments. It is also true that the child, in the first period of life, has no starch-digesting ferment in its alimentary canal, and thus the starchy portion of the food is not utilized, even if it does not give rise to the above disorders. Leaving this out of consideration, the child and the invalid will find in the starch neither the necessary amount of albuminous substance (protein) for the information of the muscles, brain, etc., nor the required amount of mineral matter for the building up of the bones, teeth, etc.

The fibre, when present in large quantities is apt to act as an irritant, causing unduly rapid and therefore imperfect digestion. In the samples under consideration, however, it has been for the most part eliminated.

A remarkable fact in connection with all these foods is the lack of fat, as shown by the analyses. This is principally due to the endeavor on the part of the manufacturers to avoid two objections to

fat: fat easily becomes rancid, and thus tends to spoil the food containing it, and it is also rather indigestible for weak stomachs; but this lack of fat is to be regretted in many cases, as fat is that food-principle which furnishes the most potential energy after digestion, being less rich in oxygen than any other class of food.

It is true that in many instances these foods are not to be used in their natural condition, but are directed to be mixed and boiled with, or otherwise prepared with milk or milk and water. This treatment will, of course, greatly improve them, and supply many of those elements which are lacking. Such treatment is to be applied to those samples which are marked with a star (*). Unfortunately, even such treatment will only in a few instances bring the foods up to the standard of the mother's-milk, which they are expected to replace.

That mother's-milk is the most natural food during the first or infant year of life of man, is the generally accepted opinion of all competent judges. It is best, therefore, not to vary from this, except for the most important reasons. Woman's-milk has, as is shown as the result of 80 analyses, the following average composition:

	Water.	Protein. (Casein and albumen.)	Fat.	Milk-sugar.	Ash.
Woman's milk, ...	87.02	2.36	3.94	6.23	0.45

If the proportion of the nitrogenous substances or protein in the above table is taken as 1, that of the fat and carbohydrates (after the fat has been multiplied by 2.5 in order to reduce it to the value of the carbohydrates), will be 6.8 and this proportion of 1: 6.8 is called the proportion of food values of woman's-milk by physiological chemists, and is often used as a standard whereby to judge the value of other foods. Thus compared, asses milk, which is the nearest to mother's-milk in composition, has a proportion of 1: 4.6; while cow's milk, which is of necessity so frequently substituted for the latter, has a proportion of 1: 4.1 as is shown in the following table, which gives the average of a great number of analyses:

	Water.	Protein.	Fat.	Milk Sugar.	Ash.
Asses milk, ...	89.64	2.22	1.64	5.99	0.51
Cow's milk, ...	87.42	3.41	3.65	4.81	0.71

These milks, therefore, like all other milks, as compared with mother's-milk, are either deficient in fat, or are too rich in protein, and the proportion of food values, especially in cow's milk, is too narrow. Many other objections can be justly raised against cow's milk, such as the fact that it is not usually aseptic, or free from germs (like mother's-milk); that it is usually the mixed product of a whole herd, that is often either watered or skimmed, etc. These facts are what has led to such a universal adoption of these substi-

tutes for mother's-milk; which substitutes, however, do not, as a rule, replace the latter as they should, even after they have been prepared with milk, as is so frequently directed.

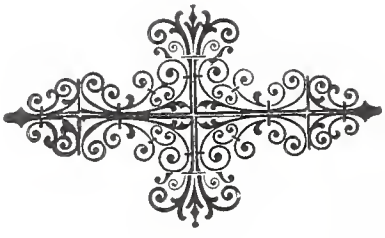
This had led to the rejection of all of these substitutes by some of the most eminent physiological chemists, and to the recommendation, in cases of necessity, to use various modifications of cow's milk so prepared as to resemble mother's-milk. Probably the best of these modifications is that made by Ph. Biedert in his "Untersuchungen ueber die Chemischen Unterschiede der Menschen-und Kuhmilch, Stuttgart, 1884." He makes a mixture of 5 ounces sweet cream, 15 ounces boiled water and ½ ounce milk-sugar." This mixture suitable for the first period or for sickly children, is strengthened as the digesting power of the child increases, by the addition of cow's milk, first 2 ounces, then 5 ounces, then 9½ ounces, and lastly 13 ounces to the first mixture. In this manner, the transition is made, first, to somewhat diluted, and finally to pure cow's milk. In all cases, it is best to sterilize the cow's milk used by means of a suitable steam sterilizing apparatus."

Respectfully,

F. T. ASCHMAN,

Professor of Chemistry, Pittsburgh College of Pharmacy.

It may be pertinent to add that any method of preserving milk must avoid impairment of its nutritive value. If it fails in this, it falls short in essential qualities. Sterilization may be practiced in the home or nursery by putting it as soon as possible after drawing from the cow and the animal heat has been removed, in earthen, tinned or porcelain-lined vessels which can be hermetically closed from the outer air. The vessel should be scalded in boiling water for not less than five minutes before the milk is placed in it. Having sealed it, dip the vessel containing the milk into water heated to below the boiling point until the contents have been raised to a temperature of not less than 155 degrees Fahrenheit, being careful not to allow the water to boil, thus avoiding the scalding or cooking of the albuminoids. It should remain in the heated water for from 15 to 20 minutes, the vessel containing the water being removed from the fire to prevent boiling the milk. It may then be removed and placed in a cool place until used, but should always be hermetically sealed to prevent exposure to the air. When milk is so treated for infants, the sterilizing process should be practiced immediately before it is given to the child.



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